



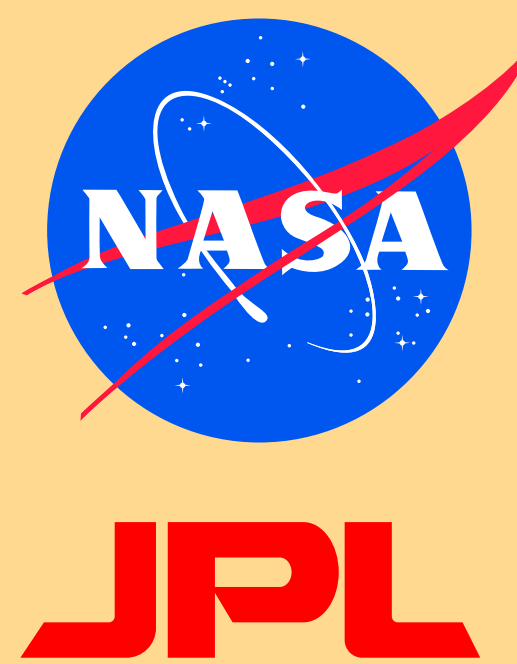
# Tape recorder effect observed in HCN

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## Summary

- Recent observations of HCN show a tropical tape recorder effect, like that observed in H<sub>2</sub>O and CO.
- It is unsurprising that the recording can exist, because HCN is stable in the lower stratosphere...
- ...but we don't understand what process is recording the signal on the tape, or why it doesn't repeat annually.

- Air in the tropical lower stratosphere rises slowly, carrying with it properties which it had on entering the stratosphere.
- A species which is stable in the stratosphere, but has seasonal variations at the tropopause will have alternating bands of low and high mixing ratio in the lower stratosphere.
- This effect is known as the tropical tape recorder: the air is the 'tape' and some process at the tropopause is the 'recording head'.
- Discovered in observations of water vapour[1]
- Recently observed in CO (from EOS MLS[2]) and in CO<sub>2</sub> (*in situ*[3]).
- Figure shows CO and H<sub>2</sub>O tape recorders. CO signal fades out rapidly owing to short chemical lifetime
- New tape recorder discovered in HCN, from MLS and ACE-FTS (Figure)
- EOS MLS data are 7-day, 10° zonal means, retrieved from ZM radiances[4] (raw data are very noisy)
- ACE-FTS (V2.2) data has reasonably low noise within its limited vertical range.
- ACE-FTS is an occultation instrument: observes near equator only a few times per year (black diamonds).
- HCN stable in lower stratosphere: tape signal persists up to 32 km
- Mystery:** HCN signal does not repeat annually (even though HCN and CO are both biomass-burning products)
- Reasons?**
  - HCN has longer lifetime than CO
  - Biomass burning varies from year to year
  - Maybe non-annually repeating fires produce more HCN?

## References

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## Credits

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